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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
| 09/932,236 | 08/16/2001 | Haining Yang | MI22-1725 | 4828 |
| 21567 | 7590 | 12/12/2008 | EXAMINER | |
| WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201 | | | MITCHELL, JAMES M | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

09/932,236

Applicant(s)

YANG, HAINING

Examiner

JAMES M. MITCHELL

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 August 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 50 and 70-74 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 50 and 70-74 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF/IC)
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date 8/14/08

DETAILED ACTION

This office action is in response to applicant's remarks filed August 14, 2008.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on August 14, 2008 was in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 55 and 70-74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marsh (U.S. 2001/0055869) in combination with Fazan et al. (U.S. 6,495,427).

Marsh (Fig. 2, 3) discloses:

(cl. 45, 71) a method of forming a conductive material comprising: providing a semiconductor substrate (7; Par. 0061) forming an insulative material (40) over the substrate, wherein the insulative material comprises sidewalls defining an opening to the substrate (e.g. perimeter surrounding 75 extends down to substrate), forming a first conductive material (75) over the substrate and within the opening, the first conductive material comprising one or more of TiN, WN, TaN, elemental Ta and elemental Ti (e.g. "Ti"; Par. 0064); depositing a second conductive material (105) physically against the first conductive material, the second conductive material consisting essentially of a

metal and being different than the first conductive material (e.g. "cobalt"; CLAIM 12 of Marsh), providing a metal-organic precursor proximate the conductive material (e.g. substrate within depositing reactor/chamber; Par. 0038), wherein the precursor consist of/ or essentially of tricarbonyl-cyclohexadiene ruthenium and therefore metal and carbon (Par. 0055, 0072); exposing one or more metallo-organic precursors to a reducing atmosphere to release metal from at least one of said precursors (e.g. metal, 105 formed on 75; Par. 0069) without an insulative composition between the first and second conductive material (e.g. Fig. 3), wherein the reducing atmosphere comprises ammonia (e.g. metal released from precursor in chamber that provides a reducing atmosphere; 0031, 0039, Par. 0041); the second conductive material has a thickness of about 450A (Par. 0044);

(cl. 55) wherein the second conductive material is rectangular (e.g. Fig. 3)

(cl. 70, 74) wherein the block (105) is aligned horizontally above the insulative material (40) in at least one cross-section;

(cl. 72) the precursor consist of/essentially of tricarbonyl-cyclohexadiene ruthenium (Par. 0055, 0072);

(cl. 73) the second conductive material has a thickness of about 450A (Par. 0044).

Marsh does not show etching its second conductive material into the rectangular block or wherein the sidewall of the block are aligned vertically between the sidewalls defining the opening in at least the one cross-section.

However, Fazan (e.g. Fig. 17-18) discloses etching conductive material ("CMP"; Col. 8, Lines 19-22).

It would have been obvious to one of ordinary skill in the art to incorporate etching Marsh's conductive material in order to form its second conductive material in a rectangular shape as taught by Fazan (105, Fig. 18) and as required by Marsh (105, Fig. 3).

Neither, Marsh or Fazan appears to show the sidewalls of the block aligned vertically between the sidewalls defining the opening in at least the one cross-section.

However, because shifting the block such that both sidewalls would be aligned between the sidewalls of the opening would not have modified the operation of the device, its rearrangement would not impart patentability and would have been obvious as a matter of design choice. cf. In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950) (Claims to a hydraulic power press which read on the prior art except with regard to the position of the starting switch were held unpatentable because shifting the position of the starting switch would not have modified the operation of the device.); In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975) (the particular **placement of a contact** in a conductivity measuring device was held to be an obvious **matter of design choice**). [emphasis added]

Claim 55 and 70-74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buchanan et al. (U.S. 6,984,591) in combination with Marsh (U.S. 2001/0055869) and Fazan et al. (U.S. 6,495,427).

Buchanan (e.g. Fig. 30) discloses:

(cl. 55, 71) a method of forming a conductive material, comprising: providing a semiconductor substrate (30); forming an insulative material (not labeled surrounding plug 31 in IC fabrication; Fig. 30) over the substrate, wherein the insulative material comprises sidewalls defining an opening extending to the substrate in at least one cross-section (e.g. perimeter around 31); forming a first conductive material (31) over the substrate and within the opening, the first conductive material comprising one or more of TiN, WN, TaN, elemental Ta, and elemental Ti ("Ti"; Col. 27, Lines 40-44); depositing a second conductive material (32) physically against the first conductive material into a rectangular block (e.g. vertical outer portion of 32 along 83), the second conductive material consisting essentially of a metal and being different than the first conductive material (e.g. "TaN"; Col. 27, Lines 40-50), wherein the depositing comprises: providing a metallo-organic precursor proximate the first conductive material (e.g. substrate within depositing reactor/chamber), wherein the metallo-organic precursor comprises ruthenium, Ru; and exposing the precursor to a reducing atmosphere to release the metal from the precursor (Abstract) to form the second conductive material physically against the first conductive material without an insulative composition between the first and second conductive materials (e.g. 32 on 31; Col. 8, Lines 26-29), wherein the reducing atmosphere consists essentially of ammonia (Col. 20, Lines 12-16 & 20-23);

(cl. 70, 74) wherein the block of second conductive material (32) is aligned horizontally above the insulative layer (e.g. 32 above 31 that's in insulative material; Fig. 30).

Buchanan does not appear to explicitly disclose its precursor as tricarbonyl-cyclohexadiene ruthenium, etching of its second conductive material into the rectangular block or the sidewall of its block aligned vertically between the sidewalls defining the opening in at least the one cross-section.

Marsh teaches use of tricarbonyl-cyclohexadiene ruthenium (Par. 0055, 0072).

It would have been obvious to one of ordinary skill in the art to incorporate the use of tricarbonyl-cyclohexadiene ruthenium to the process of Buchanan in order to provide a type of ruthenium precursor as taught by March (Par. 0055) as required by Buchanan ("Ru"; Abstract). See also M.P.E.P 2144.07.

Neither Buchanan nor Marsh appears to explicitly disclose etching of its second conductive material to form its second conductive layer (32).

However, Fazan (e.g. Fig. 12-13B) discloses etching of a conductive material ("CMP"; Col. 7, Lines 25-30).

It would have been obvious to one of ordinary skill in the art to incorporate etching the conductive material of Buchanan order to shape its second conductive material as taught by Fazan (85, Fig. 13B) and as required by Buchanan (105, Fig. 30).

Neither, Buchanan, Marsh or Fazan appears to show the sidewalls of the block aligned vertically between the sidewalls defining the opening in at least the one cross-section.

However, because shifting the block such that both sidewalls would be aligned between the sidewalls of the opening would not have modified the operation of the device, its rearrangement would not impart patentability and would have been obvious

as a matter of design choice. Cf. *In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950) (Claims to a hydraulic power press which read on the prior art except with regard to the position of the starting switch were held unpatentable because shifting the position of the starting switch would not have modified the operation of the device.); since it has been held that *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975) (the particular **placement of a contact** in a conductivity measuring device was held to be an obvious **matter of design choice**). [emphasis added]

Furthermore with respect to the thickness and sizes of the conductive material and openings in claims 55, 71 and 73, applicant has not disclosed that the claimed size/particular dimensions of its conductive layer and or openings are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. As, such, the selection of the claimed dimensions would have been obvious to one of ordinary skill in the art, since it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Response to Arguments

Applicant's arguments filed August 14, 2008 have been fully considered but they are not persuasive. Applicant contends the prior art does not disclose that the material

of items 105 and 75 are different. Examiner respectfully disagrees. For example, contrary to applicant's assertion e.g. cobalt or platinum disclosed in paragraph 0067 and its claims 12 and 13 is not taught as a material for barrier 75, see for example paragraph 0064. Because an embodiment discloses different material the claim is encompassed within the prior art.

With respect to the required title change, pursuant to MPEP 606.01 the examiner, if the case becomes allowable, will change the title by examiner's amendment.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES M. MITCHELL whose telephone number is (571)272-1931. The examiner can normally be reached on M-F 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mathew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Zandra V. Smith/
Supervisory Patent Examiner, Art
Unit 2822

December 7, 2008
/James M. Mitchell/
Examiner, Art Unit 2813